

Working and Formal Title:  
SubGroup Variations in Self-Management Behavior  
Among Adult Utahns with Diabetes

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Abstract:

Diabetes complications can be avoided or delayed if patients adhere to a regimen of self-management behaviors. Little, however, is known about what factors influence engagement in these behaviors and how these effects might vary in strength and direction across self-management behaviors among adult Utahns with diabetes. This research, therefore, employs multivariate logistic regression techniques to explore the degree and nature of the effects of seven covariates on four self-management behaviors among a sample of 321 adult Utahns with diabetes. The results point to a high degree of selectivity in the strength and direction of effects across the four self-management behaviors.

Diabetes is a serious disease for which effective management requires substantial and persistent commitment from patients. Complications of this potentially fatal disease include blindness, amputation, kidney failure, and heart failure. While the regimen can be inconvenient and time-consuming, effective management can delay complications or prevent them altogether.<sup>1</sup> Patient management covers a broad spectrum of lifestyle adaptations including such behaviors as daily monitoring of blood glucose levels, following a meal plan, checking feet daily for sores or irritations, and participating in a regular exercise program.

Regimen prescriptions are filtered through the interpretive lenses of diverse subgroups and subgroups may differ in their capacity or ability to meet regimen demands. These subgroup variations in perceptions and coping ability can produce subgroup differences in compliance with a particular self-management regimen. Thus, members of one subgroup might exhibit a greater or lesser likelihood of engagement in a particular self-management behavior than members of another subgroup. For example, males may interpret the need for strict adherence to a regimen differently than females, and persons in poor physical and mental health may face greater obstacles in coping with the requirements and demands of a self-management regimen than those in better physical and mental health.

Various practice regimens, however, entail different requirements and demands, and attendant levels of financial, time, and energy investments. For example, daily monitoring of blood glucose levels carries a considerably more complex set of requirements and demands, and degree of personal investment than conducting daily foot exams. A certain amount of investment must be made in obtaining a glucometer and

a certain amount of training in its use. Test strips are costly. Daily foot exams, on the other hand, are minimally invasive, requiring only a visual and manual inspection; no equipment is necessary.

Since regimens themselves vary in requirements, demands, and accompanying levels of personal investments, subgroup variations in strength and direction of effect might reasonably be anticipated across self-management behaviors. For example, subgroup variations could be greatest where regimens have complex requirements and demands, involving high personal investment, e.g., daily blood glucose monitoring. Conversely, subgroup variations would be less evident where regimen requirements and demands are less complex, involving lower levels of personal investment, e.g., daily feet checking. Finally, members of certain subgroups may be more compliant regarding one treatment regime but less compliant on another than members of another counterpart subgroup; hence, there could even be a reversal in the direction of influence.

In summary, the above discussion suggests that compliance involves a complex meshing of subgroup perceptions and coping ability with the diverse requirements, demands, and accompanying personal investment demands of various regimens. Little is known, however, regarding these dynamics among adult Utahns with diabetes. A good beginning point is to document the influence of subgroup membership on a range of self-management behaviors among adult Utahns with diabetes. Therefore, the present investigation is centered on exploring the degree and nature of the effects of seven covariates on four self-management behaviors among a sample of adult Utahns with diabetes. The self-management behaviors include blood glucose monitoring, checking feet for sores and irritations, following a meal plan, and exercising. Specifically, this study seeks to ascertain the degree of selectivity or consistency in the pattern of effects and overall fit of the model across self-management behaviors; and (2) which specific covariates appear most relevant to an understanding of each self-management behavior.

#### DATA AND METHODS:

The data for this analysis were drawn from a 2002 statewide telephone survey of Utahns with diabetes.

The survey was aimed at collecting data on self-management behaviors, complications, and provider care

among Utahns diagnosed with diabetes. The present analysis focuses on a weighted sample of 321 respondents who provided information on all of the variables included in the analysis.

As previously indicated, four self-management behaviors are examined drawn from responses to the survey questions. Each behavior is measured as a dichotomy. For both glucose monitoring and foot checking, those who replied engaging in the behavior at least once daily were coded as “1”, while those who did not were coded “0”. Those who followed a meal plan were coded “1” whereas those who did not were coded “0”. Those exercising at least three times a week (regardless of intensity or duration) were coded as “1”, while those exercising less than three times a week or not at all were coded “0”.

All seven covariates were measured as dichotomies to facilitate adequate number of cases in each category. The coding was as follows: Age (50 Years or Older=1; Else=0), Gender (Male =1; Female =0); Diagnosis Duration ( 5+ years since diagnosis =1; Else=0); Education (College Graduate or Higher =1; Else=0); Health Status (Good, Very Good, Excellent=1; Fair/Poor=0); Not Depressed (=1; Else =0); Diabetes Education During 12 Months Preceding Survey (Yes=1; No=0).

Data were analyzed using multivariate logistic regression analysis with the primary focus on the odds ratios measuring the effect of each covariate, considered simultaneously, on the relevant self-management behavior as well as the model chi-square to assess the overall goodness-of-fit of the model for each self-management behavior. This method was chosen to see if membership in a certain subgroup significantly increased (or decreased) the likelihood of participation in a self-management behavior vis-a-vis a counterpart subgroup across the four self-management behaviors. For example, to what degree were males more or less likely to conduct daily blood glucose monitoring than females and how this impact might vary in strength and direction vis-a-vis daily foot checking, following a meal plan, and exercising regularly? Analysis of the simultaneous effect of the respective covariates across a range of four self-management behaviors enables observation of the degree of selectivity or consistency in the strength and direction of effects. Interest is also centered on delineating which covariates exert statistically significant effects on a specific self-management behavior.

Table 1. Results of Multivariate Logistic Regression Analyses of Four Diabetes Self-Management Behaviors								
Covariates	Daily Blood Glucose Monitoring		Daily Feet Checking		Following a Meal Plan		Exercising 3+ Times a Week	
	Odds Ratio	C.I.	Odds Ratio	C.I.	Odds Ratio	C.I.	Odds Ratio	C.I.
Age (50+=1)	0.45**	0.25-0.83	1.91*	1.07-3.43	1.01	0.59-1.73	1.14	0.66-1.97
Gender (Male=1)	0.52**	0.37-0.85	0.72	0.42-1.22	0.56**	0.35-0.89	1.94**	1.20-3.12
Diagnosis duration (5+ years=1)	1.65*	1.01-2.70	0.91	0.54-1.56	0.54**	0.33-0.87	1.20	0.74-1.94
Education (college grad+=1)	0.59*	0.35-1.00	0.50**	0.29-0.87	1.04	0.62-1.72	0.79	0.47-1.33
Health Status (good, very good, excellent =1)	1.04	0.61-1.76	1.25	0.71-2.19	1.43	0.87-2.35	1.38	0.83-2.28
Not depressed (=1)	1.07	0.54-2.12	0.90	0.44-1.87	1.18	0.63-2.23	1.96*	1.04-3.68
Diabetes education in past year (=1)	2.71***	1.48-4.96	1.87*	0.99-3.51	1.22	0.72-2.05	1.03	0.61-1.76
Initial Log Likelihood	427.55		372.96		442.56		430.45	
Model $\chi^2$	37.74**		16.22*		14.19*		17.72*	
d.f.	7		7		7		7	
(n)	(321)		(321)		(321)		(321)	
*** p ≤ .001; **p ≤ .01; * p≤ .05								

## FINDINGS

Table 1 shows the results obtained from the multivariate logistic regression analysis of the four diabetes self-management behaviors. The findings point to a high degree of selectivity in the effects of covariates. No covariate exerts a statistically significant effect on all of the self-management behaviors considered in this study. Better self-reported health does increase the likelihood of engaging in each self-management behavior; however, the magnitude of influence varies and in no case is the impact statistically significant. The most prevailing effect is observed for gender, exerting statistically significant effects on three of the four self-management behaviors. However, the direction of effect varies across the behaviors. Being male significantly lowers the odds of daily blood glucose monitoring and following a meal plan by nearly one-

half (odds ratio of 0.52;  $p \leq .01$  and 0.56;  $p \leq .01$ , respectively), but nearly doubles the likelihood of exercising at least three times per week (odds ratio = 1.94;  $p \leq .01$ ).

Four covariates (age, diagnosis duration, education, and diabetes education in the past 12 months) each exert a statistically significant effect on two of the behaviors. Each of these covariates has a statistically significant influence on daily blood glucose monitoring. Three of the four covariates (age, education, and diabetes education) also exert a statistically significant effect on daily feet checking, whereas the fourth (diagnosis duration) exerts its second effect on following a meal plan. However, there are some notable variations in direction across self-management behaviors. A fuller comparative discussion of the nature of these effects across the self-management behaviors follows.

Although age and education significantly impact both daily blood glucose monitoring and feet checking, there are some interesting variations in the patterning. Being 50 or more years of age is linked to a statistically significant lowering of the odds of daily blood glucose monitoring by more than one-half (odds ratio=0.45;  $p \leq .01$ ), but a statistically significant near doubling of the likelihood of daily feet checking (odds ratio=1.91;  $p \leq .01$ ) relative to their counterparts who are less than 50 years of age. Most interesting is the counterintuitive finding that those adults with diabetes who have a college degree or higher are significantly less likely to conduct daily blood glucose monitoring and feet checking than their counterparts with less than a college degree. Having a college degree or higher lowers the odds of daily blood glucose monitoring by about two-fifths (odds ratio=0.59;  $p \leq .05$ ) and daily feet checking by one-half (odds ratio=0.50;  $p \leq .01$ ) vis-a-vis those who are not college graduates.

Duration of diagnosis also impacts two of the self-management behaviors, namely, daily blood glucose monitoring and following a meal plan, but the direction varies. Being five or more years post-diagnosis significantly elevates the likelihood of daily blood glucose monitoring by nearly two-thirds (odds ratio=1.65;  $p \leq .05$ ), but significantly lowers the likelihood of following a meal plan by nearly one-half (odds ratio=0.54;  $p \leq .01$ ).

Diabetes education significantly and positively increases the likelihood of both daily blood glucose monitoring and feet checking. In particular, diabetes education nearly triples the odds of daily blood

glucose monitoring (odds ratio=2.71;  $p \leq .001$ ) and nearly doubles the odds of daily feet checking (odds ratio=1.87;  $p \leq .05$ ). Although being associated with a slight increase in the likelihood of following a meal plan and exercising, the effect of diabetes education on these two behaviors is not statistically significant.

Not being currently treated for depression has a statistically significant positive impact on just one of the four self-management behaviors; namely, exercising. Not being depressed significantly doubles the odds of exercising at least three times per week (odds ratio=1.96;  $p \leq .05$ ).

The model chi-square is statistically significant for all four self-monitoring behaviors suggesting a good fit in each case. The level of significance is below .001 level of probability for daily blood glucose monitoring and below the .05 level of probability in the case of the other three behaviors. There are five statistically significant effects on daily blood glucose monitoring. Being a younger adult, female, five plus years being post-diagnosis, not having a college degree, and having had diabetes education in the past year, all significantly increase the likelihood of engagement in daily blood glucose monitoring. There are two statistically significant effects for each of the remaining self-management behaviors. Being an older adult and not having a college degree significantly increase the odds of daily feet checking. Females and those less than five years post-diagnosis are significantly more likely to follow a meal plan than males and those five or more years post-diagnosis. Finally, being male and not depressed significantly increases the odds of exercising three or more times a week.

## CONCLUSIONS

The main objectives of this study were to explore the extent and nature of influence of a set of seven covariates across four important diabetes self-management behaviors. The findings point to a complex patterning of effects across the four self-management behaviors and to see which configuration of covariates best explains variation in each self-management behavior. Statistically significant effects were highly selective in terms of self-management behaviors. Moreover, consistency in strength of effect did not necessarily imply consistency in direction. The greatest degree of differentiation was observed for daily blood glucose monitoring, one of the more complex regimens with attendant high costs. There were five statistically significant covariates, and the model provided the best fit of the four self-management



behaviors. Nonetheless, even feet checking, with its simplicity and low effort elicited two statistically significant effects.

The results of this analysis also suggest that strategies aimed at increasing daily blood glucose monitoring need to pay particular attention to older adults, males, those who are less than five years post-diagnosis, and surprisingly, those with a high level of formal education. At the same time, diabetes education does play a very positive role in increasing the likelihood of daily blood glucose monitoring. Therefore, increased efforts should be placed in expanding diabetes education to insure greater adherence to blood glucose monitoring. Diabetes education showed a similar positive effect on the likelihood that persons with diabetes will check their feet for sores or irritations at least once daily. Thus, even with this minimally invasive self-management behavior, additional diabetes education efforts yield beneficial results. At the same time, however, it should be noted that diabetes education did not play a prominent role in increasing engagement in the other two behaviors, namely, following meal plan and exercising regularly. Further attention, therefore, should be directed towards understanding how diabetes education programs could more effectively address these two behaviors.

Depression seemed to play a minor role in promoting self-management behaviors when all other factors were considered, except in the case of regular exercise participation. Thus, even though blood glucose monitoring entails complex requirements and high personal investment, mental health does not seem to play a pivotal role in the likelihood of engaging in this behavior. Exercise, on the other hand, which also entails a high degree of effort does appear dependent on mental health status. Reasons why mental health status operates differently for these two behaviors warrants further investigation.

Feet checking promotion efforts need to place more focus on younger adults and those with higher levels of education. As with daily blood glucose monitoring, diabetes education does appear to play an important role in promoting daily feet checking. Following a meal plan needs greater promotion among males and those with more recent diagnoses. In contrast, greater promotion of exercise regimens needs to be directed to females and the depressed.

The finding of a lower likelihood of daily blood glucose monitoring and feet checking among the highly educated appears paradoxical. Perhaps those highly educated Utahns with diabetes are more likely to be involved in work roles with high time demands, militating against optimal blood glucose monitoring. This tentative explanation, however, raises the question as to why the influence was also apparent for feet checking with its relatively low requirements, demands and degree of personal investment. Preliminary bivariate analyses employing a trichotomous classification for education revealed no statistically significant difference between those with one to three years of post-high school education and those with lesser amounts of education.

In summary, the results suggest an intricate interweaving of subgroup membership and various types of diabetes self-management behavior. Further work needs to be done to understand the dynamics underlying the observed variations in the strength and direction of influence of subgroup affiliation across self-management behaviors and for public health personnel to effectively address the challenges implied by these diversities in the development of program initiatives.

## REFERENCES

1. Medical Management of Non-Insulin Dependent (Type II) Diabetes (1994). (3<sup>rd</sup> ed.) Alexandria, VA: American Diabetes Association, Inc.